OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES FOR JULY:—

July 2. 18h. 0m. The Sun in Apogee.
22h. 0m. Jupiter stationary.
3. 13h. 0m. Mercury in superior conjunction with the Sun.
4. 21h. 21m. Jupiter in conjunction with the Moon (Jupiter 0° 8′ N.).
7. 4h. 0m. Venus at greatest elongation, 45° 29′ E.
8. 2h. 10m. Mercury in conjunction with Neptune (Mercury 2° 19′ N.).
11. 18h. 19m. Uranus in conjunction with the Moon (Uranus 4° 28′ N.).
14. 9h. 0m. Neptune in conjunction with the Sun.
19. 7h. 31m. Mars in conjunction with the Moon (Mars 2° 0′ S.).
20. 11h. 11m. Saturn in conjunction with the Moon (Saturn 3° 33′ S.).
,, 18h. 0m. Uranus at opposition to the Sun.
24. 14h. 42m. Neptune in conjunction with the Moon (Neptune 5° 29′ S.).
26. 20h. 0m. Mercury in conjunction with the Moon (Mercury 4° 6′ S.).
28. 9h. 18m. Venus in conjunction with the Moon (Venus 5° 47′ S.).
29. 2h. 0m. Mercury in conjunction with α Leonis (α Leonis 0° 9′ S.).
,, 13h. 0m. Jupiter at quadrature to the Sun.

REDISCOVERY OF WOLF'S COMET.—A telegram from the Kiel Centralstelle announces the rediscovery of Wolf's comet, by Prof. Max Wolf, on June 19. The position of the comet at 12h. 4·9m. (Königstuhl M.T.) was

R.A. = 18h. 46m. 16s., dec. = 13° 28′ N.,

and its magnitude was 15. The position is about 15m. west of ζ Aquilæ. According to the continuation of the ephemeris published by M. Kamensky in No. 4505 of the *Astronomische Nachrichten*, the comet will move in a north-westerly direction until July 15, when it will turn south again. Its calculated magnitude for July, September, and October is about 12·2, but from the observation the actual magnitude is, at present, somewhat fainter than the calculated.

MARS.—Observations of Mars were commenced at the Juvisy Observatory during the clear mornings of April, and several well-known features were seen. The south polar cap was seen to be surrounded by a dark belt, which certainly had the appearance of an objective phenomenon. Mare Sirenum was seen on April 24 as a diffuse spot descending from the polar cap and fading gradually towards the bright limb of the planet. The central region to the north was seen to have the accustomed yellowish-orange hue, and Titan was vaguely, but surely, seen. These observations when the apparent diameter of the planet was only 6″ show that useful observations will be possible considerably before the opposition, which takes place on November 25. The account of these early observations, in the June number of *L'Astronomie*, is illustrated by a drawing made by M. Quénisset at 16h. 20m. on April 24.

In *La Nature* (No. 1986, June 17) Dr. Mascart has an interesting illustrated article, in which he discusses the present state of the vexed question concerning the reality of the Martian canals. The general result is that the question is, as yet, by no means decided, but there is a hope that the laboratory experiments being carried on by MM. Chapeau and Danjon may do something to elucidate this difficult question further.

THE PROBLEM OF THE SOLAR MOTION.—Continuing the discussion with Prof. Comstock concerning the proper motions of faint stars, Dr. H. E. Lau publishes some interesting results, accruing from the Copenhagen measures of the Engelhardt stars, in No. 4502 of the *Astronomische Nachrichten*.

He finds that the mean proper motion of tenth-magnitude stars is 3″ per century at the most, and that it is smaller in the Milky Way than outside it. For the position of the apex he obtains A = 290°, D = +44°, and finds that the proper motions of tenth-magnitude stars indicate a greater R.A. and declination than those of the brighter stars, but the reality of this difference is still doubtful. A reduction of the measures shows that the mean parallax of these stars of the tenth magnitude lies between two and three thousandths of a second of arc, and that the error of Newcomb's precession constant does not exceed 0·1″ per century.

THE FORMS OF SPIRAL NEBULÆ.—The forms of spiral nebulæ is a matter of moment in any investigation concerning cosmical evolution, and any attempt to find some general law which these early systems follow is therefore of interest. Such a research is described by Herr Von E. v. d. Pahlen in No. 4503 of the *Astronomische Nachrichten*.

The author has studied photographs of many spiral nebulæ taken at the Lick and the Isaac Roberts Observatories, and has attempted to find general equations to their curves. Among other nebulæ, he has considered M. 33, Trianguli, M. 74, Piscium, and M. 51, Canum Venatici. In each case an Archimedian spiral was tried, but it was found that a logarithmic spiral could be found which better fitted the chief branches of the observed spirals. The agreement of the calculated and observed curves is shown by a number of graphs, and all are satisfactory except the second branch of M. 51, in which there appear several discordances. The paper also discusses the probable generation of such curves as are observed in these objects.

THE SPECTROSCOPIC BINARY *o* PERSEI.—*o* Persei is of special interest as a spectroscopic binary because, as occurs in one or two other cases, the calcium lines H and K do not appear to participate in the general variations of the radial velocity. In discussing the Allegheny observations of this star, Mr. F. C. Jordan pointed out that his value for the velocity of the centre of the system did not agree with the one obtained earlier by Vogel from the Potsdam observations, and suggested the possibility of a systematic personal error in the latter.

To clear up this point, Dr. Ludendorff has made new measures of the spectra, and finds that, although there is a marked difference between Vogel's measures and his own, yet it remains probable that the difference between Jordan and Vogel is to some extent real; possibly a third, as yet unconfirmed, body is included in the system. As the spectrum of *o* Persei is difficult to measure, further investigations will have to be made to settle this interesting point (*Astronomische Nachrichten*, No. 4500).

THE COAL-DUST QUESTION IN THE UNITED STATES AND IN AUSTRIA.[1]

THE first explosion that seems to have attracted attention to coal dust in the United States occurred at Pocahontas mine in 1884. Very little attention was paid to the subject for some years afterwards, until explosions began to occur in the western region "in shallow mines in which firedamp had never been found before the explosions, and was not found after them." Although the majority of these were not of a serious character, they gave rise to much uneasiness; but when what might be called the *black* year of 1907, with a death-roll of "1148 men killed by mine explosions," had run its course, uneasiness gave way to consternation. In 1908 Congress "made an appropriation" for the investigation of mine explosions, which became available on July 1; the United States Geological Survey was entrusted with the work, and an experimental station, which had, in the interim, been erected at Pittsburg, was officially opened on December 3 of the same year.

Experiments which, in the bulletin before us, are described as a preliminary series, have been made with the object of determining "the quantity or density of the finest size of coal dust necessary to propagate an explosion."

1 "The Explosibility of Coal Dust." By George S. Rice, with chapters by J. C. W. Frazer, Alex Larsen, Frank Haas, and Carl Scholz. United States Geological Survey, Bulletin 425. Pp. 186. (Washington: Government Printing Office, 1910.)

Abstract of the Reports on the Austrian Coal-dust experiments conducted at the Rossitz experimental station 1908–1909 by k. k. Oberbergkommissär, Dr. Czaplinski, and Werksdirektor Jicinsky. Pp. 36. (London: The Colliery Guardian Company, Limited, 1911.)

The apparatus employed is similar to that at Altofts and Liévin. It includes a cylindrical gallery 6 feet 4 inches in diameter by 100 feet long, closed by means of a block of concrete at one end; with a cannon embedded in the concrete, from which shots can be fired for the purpose of raising and igniting the dust; with small glass windows at intervals of 6 feet 8 inches apart on one side; with arrangements for fixing paper diaphragms so as to isolate certain portions of its interior when experiments with firedamp are undertaken, and so on.

The coal dust is prepared by grinding and screening coal of the following composition:—

	Per cent.
Moisture	1·94
Volatile combustible	35·11
Fixed carbon	57·73
Ash	5·22
	100·00
Sulphur	1·25

The method of conducting the experiments, and the records of their results, are both so similar to those that have been described in two previous reviews,[1] that it would be supererogatory to describe them in this place, more especially as they occupy very little space in the volume before us, and are, as has been said, mostly of a preliminary character.

The remainder of the volume is devoted to a history of the subject, in which our author has done ample justice to the work of his predecessors; to dissertations on "The Humidity of Mine Air," "Remedies for Coal Dust," "Tentative Conclusions on the Dust Problem," and "Special Features in Dust Explosions," written by the author himself, and includes special chapters on "Laboratory Investigations of the Ignition of Coal Dust," by J. C. W. Frazer; "Coal Dust Investigations at European Testing Stations," by Axel Larsen; "Exhaust Steam as a Preventive of Dust Explosions," by Frank Haas; and "Use of Steam and Water Sprays at Oklahoma Mines," by Carl Scholz.

All these subjects have already been investigated and commented upon by other earlier writers, and as there is nothing specially new or original in the articles before us, they need not further detain us in this place. The fact that the "selected bibliography" occupies twelve and a half pages, and that the titles of no fewer than two hundred and four of the papers and articles mentioned in it contain either the word "coaldust," or in some cases simply "dust" and "dusty," as applied to mines, explosions, and experiments, is an indication of the growing interest with which the subject is, and has for some time past been, regarded. Finally, considering the source from which the present report has emanated, it is perhaps almost superfluous to add that it is furnished with a complete index.

The Austrian experiments are being carried out under the auspices of the Vienna Permanent Firedamp Committee, which decided to resume them in 1908 after an interval of several years, during which operations at the experimental gallery at Babitz, near Segengottes, had been suspended. The ostensible object of this new series is "to ascertain the conditions under which coal dust—especially that of the Rossitz district—can be caused to explode even in the absence of firedamp, and to test the means hitherto employed, or proposed, for minimising or preventing coal-dust explosions, chief among them being water curtains, wet and dustless zones, and dry stone-dust zones." "Experiments with coal dust in conjunction with explosive gases are also in contemplation."

The Babitz gallery differs from the others previously referred to, first, in being built partly in masonry and partly in brick work, with an arch of the same materials overhead, and a level floor; and, secondly, in being wholly underground. Its depth under the surface is 2 metres at one end and 21·6 metres at the other. The thickness of cover increases at a fairly uniform rate from the shallower end to a distance of rather more than two-thirds of the whole length, where it attains 7 metres, and thereafter more irregularly to the deeper end. Its length is 293·7 m., and its other dimensions are:—at its deeper end, 1·3 m. wide at the sole, 1·4 m. wide at the spring of the arch, 1·74 m. high, and its sectional area 2·2 square metres; and at its shallower end, 2·4 m. high and 3·4 square metres in sectional area.

[1] NATURE, February 9, 1911, vol. lxxxvi., p. 223.

Travelling communication is established with its interior by means of three shafts, one sloping downwards to a point 1·7 metres distant from its deeper end, provided with stairs and ladders, and with a strong door both at its top and bottom; a second, sloping downwards to a point 82 metres distant from the bottom of the first, also provided with stairs and ladders, and with a strong door at its top and bottom; and a third, at its shallower end, provided with a ladder only, and with its top capable of being closed by means of balks of timber.

The space between the bottom of the deepest shaft and the end of the gallery nearest it (called the explosion chamber) is built of concrete, and is 1·7 m. long, measured in the direction of the axis of the gallery, 1·3 m. wide, and 1·82 m. high. Its open side next the gallery can be closed by means of a paper diaphragm pasted to a wooden frame fixed on the periphery of the gallery, and coal dust and firedamp can be admitted to its interior through two pipes, one for firedamp the other for coal dust, which extend down into it from the surface. At distances of 47·8 and 88·2 metres respectively from the explosion chamber, two other pairs of pipes constitute similar links of communication between the surface and the gallery. One pipe of each pair serves for the introduction of coal dust, the other as an open passage in which a shaft with a circular disc fixed to its lower end, which is in, and just below the roof of, the gallery, can be made to revolve rapidly by means of hand mechanism at the surface. The coal dust, introduced through the two pipes just referred to, falls upon the two corresponding revolving discs, and is disseminated in the surrounding air by the centrifugal force imparted to it by the motion of the discs; that similarly introduced into the explosion chamber passes immediately into the interior of a small vertical fan, made to revolve by means of an electric motor, and is thus disseminated through the air in the chamber in a similar manner.

The gallery is lighted by means of shielded incandescent electric lamps standing in niches in the walls, and is ventilated by means of an electric fan fixed in the shaft farthest from the explosion chamber. The fan is capable of exhausting 20 cubic metres of air per minute from the interior of the gallery.

The coal dust employed in the experiments is collected in the screening sheds (?) and in the workings, and only the most suitable kinds are taken. Amongst these, the finest leaves a residue of 3·8 per cent. on a sieve with 3480 meshes, and the coarsest a residue of 19·5 per cent. on a sieve with 1160 meshes per square centimetre. Its composition is as follows:—

	Per cent.
Moisture	0·58 to 4·5
Volatile matter	19·20 to 22·8
Ash	9·17

When an experiment is about to be made, coal dust is strewn about in the gallery, or placed on a series of seven narrow shelves equally spaced above each other, supported horizontally (and transversely as regards the gallery) in rectangular wooden frames suspended at intervals of 5 m. apart, or laid on slanting laths fastened to the walls, or disseminated in the air by means of the fan in the explosion chamber and the revolving discs previously mentioned, or brought into the sphere of action by any one or any combination of these means.

The explosives employed for disturbing and igniting it are cartridges of gelatine dynamite from 150 up to 300 grams, "for the most part hanging free," and fired electrically with 1-gram caps; or 300 grams of black powder placed loosely in a mortar with a bore of 450 mm. long and 27 mm. in diameter, tamped with paper, and fired with a fuse. In some cases the dynamite charges are fired in the mortar.

No account is given as to the position in which the dynamite cartridges are hung, either as regards their height above the floor or their horizontal distance from the end of the gallery or chamber; nor can we gather where, or at what height, or at what angle from the hori-

zontal, if any, the barrel of the mortar usually stands when a charge is fired from it, or whether there are two mortars, one in the explosion chamber, the other movable to any other desired position. The only reference we can find in this connection is to *a* mortar "on the floor of the gallery," fired in this particular instance at a distance of 20 m. from the explosion chamber (p. 26).

An attempt has been made to measure pressure by means of a spring indicator. We say "attempt," because the curves reproduced on pp. 19 and 22 are of identical construction with, and indistinguishable in this respect from, those obtained by the present writer with a similar contrivance in the small Royal Society gallery (1877–8). We put these curves aside at the time (although we still possess them) as altogether untrustworthy, as we were of opinion that the first impulse given to the piston was due to the initial explosion of firedamp, and its subsequent vibrations to the combined action of the momentum of the moving parts and the resilience of the spring, and not to those of the air in the gallery; and we consider the curves now before us to be of quite as little value as our own.

The length to which the flame extends is ascertained by placing a series of sulphur matches set in wooden blocks at intervals of 1 m. apart along the walls of the gallery, and observing how many of them have been burnt.

A bottle filled with water, suspended neck downwards at a distance of 10 m. from the explosion chamber, with its loosely fitting cork attached by a string to the nearest hanging frame, serves the purpose of collecting a sample of the afterdamp. When the hanging frame moves under the impulse of the blast, the cork is displaced, the water runs out, and the air and gases take its place.

The audible and visible phenomena produced by an explosion are stated to be a shock "followed by a return shock after an interval of not more than two seconds"; the shock expels a column of air from the terminal shaft (the one farthest from the explosion chamber), opens the door at the top of the intermediate shaft (when the door at its bottom, which opens *into* the gallery, has been removed), and expels a cloud of "smoke" (? dust-laden air), followed, when the explosion is violent, by a flame several yards in length; the return shock opens the iron door at the explosion chamber, closes the door at the top of the intermediate shaft, and fresh air rushes in at the shafts at both ends of the gallery. Immediately afterwards, "thick, dense, blackish-grey afterdamp" is expelled from the terminal shaft by the fan. The frames with shelves are usually torn away and shattered; and on one occasion the door at the top of the intermediate shaft, together with portions of its frame, was thrown to a distance of 30 m.

Passing over the accounts of tentative and preliminary experiments, both with suspended cartridges of dynamite and with black powder fired from the mortar, we may take the following as fairly typical examples of the best results with both kinds of explosive:—

(1) With suspended cartridges of dynamite.

With 32·5 k. of dust strewn over a length of 90 m. from the chamber, and with dust being disseminated in the air by the distributing fan in the chamber and by the revolving discs at 47·8 and 82·8 m. from the latter, the length of flame in the gallery was 124 m. and that in the intermediate shaft 24 m.

In another explosion, with a strewing of 90 m., conducted, presumably, under the same conditions as the last, but not so specified, the length of flame was 118 m.; the maximum pressure is stated to have been 1·38 atmosphere, and the duration of the explosion 0·013 second.

(2) With 300 grams of black powder fired in the mortar without tamping, when both discs and the distributing fan were at work, and 30 k. of dust "employed" (some of it probably strewn on the floor?), the length of the flame was 147 m. (p. 25).

With even the finest dust, containing 2·2 to 4·5 per cent. of moisture, only relatively slight explosions and short flames could be obtained with either dynamite or black powder; but with even coarse dust, containing only 0·7 to 1·7 per cent., strewn over a distance of 88·2 m., flames up to 147 m. were produced.

In the second series of experiments, which were made after a new door, that could not be opened by the explosion, had been fixed at the bottom of the intermediate shaft, and a third revolving disc placed at a distance of 120 m. from the chamber, a flame of 200 m. in length was obtained in one of the experiments with a charge of 250 grams of dynamite and with 129 grams of coal dust per cubic metre (containing 13·3 per cent. of ash, 0·45 of moisture, and 19·2 of volatile matter), disseminated over a distance of 120 yards. This coal dust left 12·2 per cent. on a sieve with 3480 meshes per square centimetre.

Under the same conditions, except that the dust contained 7·55 per cent. of moisture, no explosion took place.

Coal dust containing 14 per cent. of ash gave violent explosions with flames 150 m. in length, whereas that containing 47·9 per cent. did not explode.

Coal dust mixed with increasing proportions of Roman cement continued to explode until the mixture contained 63·3 per cent. of the latter. The suggested and highly probable explanation of this apparent anomaly is that the cement dust falls more quickly than the coal dust, and leaves the mixture remaining suspended in the air purer than it would otherwise be.

The influence of wet zones, and what are designated "water curtains," was also investigated. "The wet zones were formed by sprinkling in the usual way just before shot-firing, and were intensified at intervals by water curtains" (p. 34). The "usual way" is probably that described on p. 11, that is, by means of hose pipes attached to branches of a supply pipe laid along the floor of the gallery. The water curtains, which consist in sprays of water issuing upwards, downwards, and across the gallery at right angles to its longer axis from perforations or nozzles in pipes fixed on its periphery, are stated to have produced little effect on the length of the flame (p. 35).

A wet zone of 60 m. extinguishes an explosion even when a dry-dust explosion produced under the same conditions extends to 137 m. in the absence of the water. "With wet zones 36 to 57 m. long, the flame projected beyond them failed to ignite the dust in the immediately adjoining second coal-dust zone in which the third atomiser (revolving disc) was in operation."

In comparing the foregoing results with those obtained in the galleries at Altofts and Liévin, it should be borne in mind that the coal dust employed was collected at the screens and in the workings, that it, consequently, contained indefinite proportions of coarse and fine particles, and that it is lower in volatile matter than the coals employed in the two galleries named.

These less favourable conditions seem to account for its apparently lower inflammability and its greater sensitiveness with regard to increasing proportions of uncombined moisture.

From *a priori* considerations as to the nature of combustion, it might have been thought that the two following propositions could have been accepted as axiomatic, namely, that, *caeteris paribus*, (1) the finer the dust, the greater the proportion of volatile combustible matter, the drier the air and the higher its pressure and temperature, and the less the proportion of mineral matter and moisture (combined and uncombined) the more inflammable the dust; and (2) conversely, with all the conditions reversed. As it is, most of them have been verified by the results of all the recent quantitative experiments, including an excellent series on the laboratory scale by Prof. Bedson and Mr. Widdas.[1]

The results of the experiments made by the Prussian Firedamp Commission[2] seemed to contradict the second condition as to the influence of increase in the proportion of volatile matter, in regard to which they make the following remarks on p. 31:—

(3) "Bei einem Gehalte an flüchtigen Bestandtheilen von 18 bis 22 pCt. scheint die Flammenverlängerung am grössten zu sein" (vi., 4, 9, 10, 11).

(4) "Mit einem höheren Gehalte an flüchtigen Bestandtheilen tritt wieder eine entschiedene Abnahme der Flammenverlängerung ein, selbst bei ganz feinem Staube" (vi., 13, 14, 15, 18, 19, 20, 21, 22). "Es bleiben gleichwohl diese gasreichen Kohlen ohne Ausnahme noch sehr

[1] Transactions of the Institution of Mining Engineers, vol. xxxix. Part V. (1910).

[2] Anlagen zum Haupt-Berichte der Preussischen Schlagwetter-Commission, Band IV. Table VI. Pp. 35 (1886).

gefährlich, wenn dieselben hinreichend feinen Staub liefern; falls dieses aber nicht stattfindet—und dieser Fall scheint in der That recht häufig vorzukommen—bieten dieselben wenig Gefahr" (vi., 23, 24, 25).

"Hiernach haben unsere Versuche die früher verbreiteten Ansichten in diesem Punkte bestimmt widerlegt."

In this case, also, the coal dust was taken from the screens or from the mines, and employed without any previous sifting or preparation of any kind. It was thus of the same character as that employed in the Austrian gallery, and therefore subject to the same drawbacks. In by far the larger number of trials the strewing in the gallery was only 10 m. in length, and the charge of explosive was invariably 230 grams of black powder.

It is therefore undoubtedly useful to have some of the more exact numerical data established by the recent experiments in regard to even a few classes of coal, such as the limit of explosibility with decreasing volatile matter, on the one hand, and with increasing incombustible mineral matter on the other, although it is quite certain that both of these limits must necessarily be profoundly modified by the presence of more or less firedamp in the air, and by the higher temperature, lower capacity for heat, and more active oxidising properties of the oxygen in the air under the compression existing in the condensed wave of an explosion in the workings of a mine.

But it requires very little consideration of the number of natural factors that vary to show that even the most elaborate series of experiments that could possibly be carried out can only touch the outer fringe of the subject.

In these circumstances it is to be hoped that in accepting the loan of the experimental tube and other appliances at Altofts from the colliery owners, and in constituting themselves and others into a committee for the purpose of making experiments with them, the Royal Commission on Mines will confine its attention to a few very definite objects, and will, before everything else, including even the treatment of dust in the main haulage ways, bear in mind that the true solution of the coal-dust question lies in the prevention of explosions by the honest application of well-known means, that is to say, of means applied in such a manner as would, in the opinion of the present writer, who examined the scenes of the explosions in both Whitehaven and Hulton Collieries, undoubtedly have saved the lives of 480[1] men in 1910, and not in the slipshod way in which the law has hitherto allowed.

The siren song of the inventors, vendors, and advocates of rescue appliances which, it is said, have never yet saved a single life after an explosion, but have been the means of losing many; the trumpetings of those who are clamouring for the establishment of "zones," and even the counsels of those who beseech us to have mice and little birds ready to test the afterdamp, seem to have almost completely distracted attention from the real point at issue for several years past. Even the Royal Commission on Mines seems to have allowed itself to become entangled, not only in the Circean alliance referred to above, but to some extent also in a Charybdic whirlpool of supposed palliative suggestions.

As has been often said before, great explosions occur exclusively in dry and dusty mines, and are invariably begun either by the intentional detonation of an explosive (shot-firing) or by the accidental ignition and explosion of a certain volume of inflammable gas. If the coal dust lying within a certain radius of the one presumed centre of disturbance or the other were always rendered sufficiently damp beforehand to prevent it from being raised up into the air by the subsequent blast, a great explosion would be impossible in any mine. One efficient means of attaining this end consists in spraying water from the nozzle of a flexible hose attached to the branch of a water-main or to a tank on wheels containing water and compressed air. The means is, therefore, "not in heaven"—neither is it beyond the sea—"but is very nigh"—is, in fact, already in use in many of our mines.

If the Royal Commission on Mines were only strong enough and independent enough, it would specify categorically *in what manner* (by means of pipes or water-tanks) and *to what extent* (distance or radius, and quantity per unit of area) water must be applied in the case of shot-firing in order to render the operation quite safe, and (shall we also add?) in the presence of accumulations of inflammable gas; it would insist with all the weight of its Royal authority that the regulations which it recommends be placed upon the Statute Book and be rigidly enforced in the practice of every dry and dusty mine working coal with, say, 12 per cent. of volatile matter and upwards, whatever may be the nature of its roof and floor; and it would add in the way of serious and impressive advice to all engaged in mines of this class words of similar import to those employed by the great Hebrew lawgiver in similar circumstances:

"And thou shalt teach them diligently unto thy children,
And shalt talk of them when thou sittest in thine house,
And when thou walkest by the way,
And when thou liest down and when thou risest up.
And thou shalt bind them for a sign upon thine hand,
And they shall be as frontlets between thine eyes,
And thou shalt write them upon thy posts, and on thy gates."

W. GALLOWAY.

[1] Whitehaven Colliery, May 11, 136; Pretoria Pit, Bolton, December 21, 344.

ENTOMOLOGICAL PAPERS.

AMONG a batch of papers received from the Entomological Bureau of the U.S. Department of Agriculture, perhaps the most generally interesting is one, by Mr. F. C. Bishopp, on the distribution of the Rocky Mountain spotted-fever tick (*Dermacentor venustus*). Now that the fever is known to be principally, if not exclusively, transmitted to man by the tick, the determination of the distributional area of the latter has become a matter of importance. Western Montana is the district where the disease occurs in its most virulent form, but it is also met with, although in a less severe type, in parts of Idaho, Wyoming, Utah, and Nevada, and these areas coincide to a great extent with the maximum abundance of the tick, the whole range of which includes parts of Washington, Montana, Oregon, Idaho, Wyoming, Nevada, Utah, Colorado, and a small tract in New Mexico. In its earlier stages the tick infests small mammals, but later on migrates to the larger domesticated species, and it is in districts where the latter abound and brush-wood is plentiful that it attains its maximum development. Unfortunately, the disease appears to be spreading.

In a second pamphlet Mr. T. L. Patterson records the results of investigations into the habits of the larvæ of certain flies of the family Sarcophagidæ in relation to the pernicious gipsy moth (*Porthetria dispar*). As a rule, the sarcophagid maggots feed only on decomposing pupæ of the moth, but consignments from Europe and Japan suggest that the larvæ of some of the flies may be truly parasitic on the pupæ, in which case it is hoped that an additional means of controlling the ravages of the moth may be obtained.

Other pamphlets deal with the "asparagus-miner" (*Agromyza simplex*), insects affecting stored grain, and the one-spray method of checking the codling-moth and the plum-weevil.

According to the report of the Dominion entomologist, Dr. C. G. Hewitt, issued in the annual Report on Experimental Farms for 1909–10, Ottawa, a new Destructive Insect and Pest Bill was introduced during the period under review into the Canadian Parliament. The necessity for such legislation, owing to the rapidly increasing volume of foreign trade, was pressing, as it was essential to provide means against the introduction, or reintroduction, of such pernicious species as the San José scale and woolly aphis, and the brown-tail and gipsy moths. The brown-tail moth, introduced some years ago, is still the most important enemy against which the Entomological Department has to fight, and it is essential that every possible means should be taken to prevent its spread, as otherwise the financial and other losses caused by its devastations will be appalling. It is satisfactory to learn that there were no serious injuries caused during the year by insects harmful to cereal crops, which form the staple of Canadian agriculture.

Interesting observations on the duration of life in *Samia cecropia*, a common American moth, are recorded by Mr.